PHYSICS

WITH

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for

1st secondary stage

1 MOST IMPORTANT LAWS:

The physical quantity	Law	Unit	Dimensional formula	Factors affecting it
Absolute error	$\Delta X = \lvert X_0 - X \rvert$	-----		
Relative error	$r_x = \Delta X / X_0$		Has no dimensions	
Velocity	$V = d/t$	m/s	LT^{-1}	Displacement and time
Acceleration	$a = V_f - V_i / t$	m/s^2	LT^{-2}	Change in Velocity and time
1st equation of motion	$V_f = V_i + at$	m/s		
2nd equation of motion	$d = V_i t + 1/2 a t^2$	m		
3rd equation of motion	$V_f^2 = V_i^2 + 2ad$	$(m/s)^2$		
Resultant force	$F_{res} = \sqrt{F_x^2 + F_y^2}$	N	MLT^{-2}	
Scalar (dot) product	$A.B = A.B \cos\theta$			
Vector (cross) product	$A.B = A.B \sin\theta\, n$			
Average velocity	V =total d/total t	m/s	LT^{-1}	
Maximum height (Y-axis)	$h = V_{iy} t + 1/2 g t^2$ $V_{fy}^2 = V_{iy}^2 + 2gh$	m	L	
Horizontal initial velocity	$V_{ix} = V_i \cos\theta$	m/s	LT^{-1}	
Vertical initial velocity	$V_{iy} = V_i \sin\theta$	m/s	LT^{-1}	

Maximum horizontal range ($a_x=0$)	$d= V_it+1/2at^2$ $R= V_{ix}t+1/2a_xt^2$ $R= V_{ix}t$	m	L	
Time to reach maximum height	$h= V_{iy}t+1/2gt^2$ $V_{fy}=V_{iy}+gt$	sec	T	
Newton`s 1st law	$\sum F=0$			The object moves with uniform velocity (zero acceleration)
Newton`s 2nd law	$F=ma$	N	MLT^{-2}	Mass and acceleration
Newton`s 3rd law	$F_1=-F_2$			The two forces act upon two different objects

Most used relations in DIMENSIONAL FORMULA

Physical quantity	Law	Dimensions	SI unit
Velocity	$V=d/t$	M^0LT^{-1}	$m.s^{-1}$
Acceleration	$a=V/t$	M^0LT^{-2}	$m.s^{-2}$
Force	$F=ma$	MLT^{-2}	$Kg.m.s^{-2}$
Energy	$E=W=Fd$	ML^2T^{-2}	$Kg.m^2.s^{-2}$
Pressure	$P = F/A$	$ML^{-1}T^{-2}$	$Kg.m^{-1}.s^{-2}$

2 MAIN POINTS

1. Length measuring tools are **METER TAPE**, **RULER**, **VERNIER CALIPER** and **MICROMETER**.
2. Measuring units

Unit of measure	Gaussian (French) system	British system	Metric system
Length	centimeter	Foot	meter
Mass	gram	Pound	Kilogram
Time	second	second	second

3. Measuring units in INTERNATIONAL SYSTEM of units (SI UNITS)

NO	PHYSICAL quantity	INTERNATIONAL unit
1	Length	Meter
2	Mass	Kilogram
3	Time	Second
4	Electric current intensity	Ampere
5	Absolute temperature	Kelvin
6	Amount of material	Mole
7	Luminous intensity	Candela
8	Angle measure	Radian
9	Solid angel measure	Stradian

4. Time measuring tools are **HOURHLASS**, **CLOCK** and **STOPWATCH**.
5. We use **HYDROMETER** to measure the **DENSITY** of liquids directly.
6. Standard kilogram and standard meter are made of an alloy made from **PLATINUM** and **IRIDIUM**.
7. The unit of measure length in Gaussian (French) system is **Centimeter** while in British system is **Foot**.

8. **TIME**, **LENGTH** and **MASS** are considered form **FUNDAMENTAL** physical quantities.
9. **VOLUME**, **SPEED** and **ACCELERATION** are considered from **derived** physical quantities.
10. Mass measuring tools are **RMOAN SCALE**, **BEAM BALANCE**, **ANALOG BALANCE** and **DIGITAL BALANCE**.
11. **French** people were the first who used **METER** as a standard unit for measuring the length.
12. We use **GRADUATED CYLINDER** to measure the **VOLUME** directly.
13. When applying the right hand rule the thumb is directed to **the cross product of the two vectors** while the fingers directed **from the first vector towards the second vector.**
14. **RELATIVE** error is more accurate in measuring error than **ABSOLUTE** error
15. **MASS** and **TIME** are considered **FUNDAMENTAL SCALAR** physical quantities.
16. **DISPALCEMENT** and **VELOCITY** are considered **DERIVED VECTOR** physical quantities.
17. **FUNDAMENTAL** quantities cannot be defined in terms of other physical quantities while **DERIVED** quantities can be defined in terms physical quantities.
18. **Kilogram**, **second**, **Joule** and **meter** are measuring units of **scalar** physical quantities.
19. **Newton**, **m/s^2** and **kg.m/s** are considered units of VECTOR physical quantities.
20. Two vectors are equal when they have **THE SAME MAGNITUDE** and **DIRECTION**.
21. The **scalar** (**dot**) product of two vectors decreases by increasing the angle (θ) between them while the **vector** (**cross**) product of two vectors increases by increasing the angle (θ) between them.
22. The **transitional** motion characterized by having a starting point and end point while the **periodic** motion is the motion that repeats itself over equal intervals of time.

23. The projectile reaches the maximum horizontal range when projected at an angle **45°**.
24. Rotation of the Earth around the sun and the tuning fork are considered a **periodic** motion while motion of the train and projectiles are considered a **transitional** motion.
25. The ratio between total displacement and total time is called **Average velocity**.
26. If the object moves with **irregular** velocity so its velocity at a certain moment is called **instantaneous** velocity.
27. In **positive** acceleration the final velocity is greater than initial velocity.
28. In **negative** acceleration (decelerating motion) the final velocity is less than initial velocity.
29. When the body moves with uniform velocity so it is said that it moves with **ZERO** acceleration.
30. According to Newton`s first law, the object moves at **ZERO** acceleration unless acted upon by an external force.
31. The stationary object remains motionless if it is affected by a number of **BALANCED** forces.
32. The mathematical formula that expresses Newton`s first law is $\sum F=0$ while the mathematical formula of Newton`s third law is $F_1 = -F_2$
33. The unit of measuring force is Newton and it is equivalent to $kg.m/s^2$.
34. Newton`s first law is called the law of **inertia** while Newton`s third law is called the law of **reaction**
35. The idea of launching rockets is built on the **law of reaction** (**Newton`s 3rd law**)while rotation of satellites is built on the law of **inertia** ( **Newton`s 1st law**)
36. The action and reaction are of the **same type** and opposite in direction.
37. The horizontal range of an object projected at an angle 60° equals the horizontal range of the same object when projected at an angle **30°**.

38. The horizontal range is the same when the projectiles is projected at **complementary** angels (angles = **90°**)
39. When the body moves in circular path, it acquires an acceleration called **centripetal** acceleration that makes it moves in circular path with **constant** velocity and **changeable** direction.
40. **Friction** force, **tension** force, **Gravitational** force, **lifting** force and force of **reaction** act as centripetal forces as they act **normally** to the direction of motion and make the object moving in circular path with **constant speed** and **changeable direction**.
41. **Action** and **reaction** are paired **originated** and **vanish** together
42. **Action** and **reaction** are of the same type

3 Compare Between

P.O.C	Fundamental physical quantities	Derived physical quantities
Definition	They are physical quantities that cannot be defined in terms of other physical quantities	They are the physical quantities that can be defined in terms physical quantities.
Examples	Length – Mass – Time	Velocity – Acceleration - Volume

P.O.C	Direct measurement	Indirect measurement
Number of measurement processes	One measurement process is performed using one measuring tool	More than one measurement process is performed using more than one measuring tool
Mathematical relations	No mathematical relations is applied	A mathematical relations applied to find the quantity
Measurement errors	One measurement error may occur	More than one measurement error may occur
Examples	Measuring liquid density using the hydrometer	Measuring the liquid density via measuring mass using balance and volume by a graduated cylinder

P.O.C	Absolut error	Relative error
Definition	The difference between actual value and measured value.	The ratio between the absolute error and the real value
Mathematical relation	$\Delta X = \lvert X_0 - X \rvert$	$R = \Delta X / X_0$
Accuracy	Less accurate	More accurate

P.O.C	Scalar physical quantities	Vector physical quantities
Definition	It is the physical quantity that has magnitude only and has no direction	It is the physical quantity that has magnitude and direction
Examples	Mass – distance – speed	Force – displacement - velocity

P.O.C	Distance	Displacement
Definition	It is the actual length of the path that a moving object covers from the start point to the end point	It is the length of the shortest straight line between two positions
Type	Scalar physical quantity	Vector physical quantity
Measuring unit	Meter	Meter

P.O.C	Transitional motion	Periodic motion
Definition	The motion is characterized by having a starting point and end point	The motion that repeats itself over equal intervals of time
Examples	Train motion – Projectiles motion	Motion in a circle

P.O.C	Uniform speed	Non-uniform speed
Definition	It the change of object`s position by equal distances at equal periods of time	It is the change of object`s position by equal distances at unequal periods of time
Represented graph (distance-time)	Represented by a straight line passes by the intersection point of the two axis	Represented by a straight line parallel to the time axis

P.O.C	Speed	Velocity
Definition	It is the distance moved through a unit of time	It is the rate of change of displacement
Type of quantity	Scalar	Vector
The law	Distance / time	Displacement / time

P.O.C	Speed	Acceleration
Definition	It is the distance moved through a unit of time	It is the change of velocity in a unit of time
Measuring unit	m/s	m/s^2
The law	Distance / time	V_2-V_1 / time
Dimensional formula	LT^{-1}	LT^{-2}

P.O.C	Dot (scalar) product	Cross (vector) product
Law	A.B cos θ	A.B Sin θ n

P.O.C	Newton`s first law	Newton`s third law
Definition	A static object keeps its state of rest and a moving object keeps its state of motion at uniform velocity in a straight line unless acted upon by a resultant force.	For every action there is a reaction that equal in magnitude and opposite in direction
Mathematical law	$\sum F = 0$	$F_1 = -F_2$
The two forces	The two forces are equal But They are at equilibrium	The two forces are equal But They are not at equilibrium state
The effect of two forces	The two forces act upon only one object	The two forces act upon two different objects
The state of the object	The two forces don`t produce a change in the object`s state (i.e the object`s state remains without any change and keep its state	The two force produce a change in the object`s state (i.e the direction of motion change) or we can say the two objects move opposite direction
The change in state	They don`t cause change in object`s state	They cause change in objects` state
The name of the law	The law of inertia	The law of reaction

P.O.C	Acceleration (positive acceleration)	Deceleration (negative acceleration)
Definition	It is the acceleration of the object when its velocity increases at time passes	It is the acceleration of the object when its velocity decreases at time passes
Its sign	It has positive sign	It has negative sign
Final and initial velocities	Final velocity is greater than initial velocity $V_f > V_i$	Final velocity is less than initial velocity $V_f < V_i$

P.O.C	Newton`s 1st law	Newton`s 2nd law	Newton`s 3rd law
Definition	A static object keeps its state of rest and a moving object keeps its state of motion at uniform velocity in a straight line unless acted upon by a resultant force.	When a resultant force affects an object the object acquires an acceleration which is directly proportional to the resultant force and inversely proportional to the object`s mass	For every action there is a reaction that equal in magnitude and opposite in direction
law	$\sum F = 0$	$F = ma$	$F_1 = -F_2$

6 Mention One Use or Importance

1. Hydrometer
   (used to measure the density of a liquid directly)
2. Seat belt or air bags
   (used to stop the force of inertia to protect driver and passengers)
3. Vernier Caliper (used to measure the small lengths accurately)
4. Micrometer (used to measure the small lengths accurately)
5. Sensitive balance (used to measure the small masses)
6. Graduated cylinder
   (used to measure the volume of liquids and irregular shaped bodies)
7. Satellites
   (communication satellites that used in T.V transmission – remote sensing)
8. Cesium clock
   (determining the duration of Earth spin – checking for aviation and navigations)
9. Right hand rule
   (to define the direction of the vector product C of two vectors A and B)

7 Mention When These Quantities Equals Zero

1. The speed (When the object is at rest)
2. The distance (When the object is at rest)
3. The displacement of an object in spite of its motion
   (when the moving object returns to the initial position)
4. The displacement of an object moving in a circle
   (When it makes an integer number of revolutions)
5. The velocity
   (when the displacement =0 i.e the moving object returns to the initial position)
6. The acceleration (When the object moves with uniform speed)
7. The relative speed for a moving object

(When the observer moves in the same direction and with the same speed)

8. The final velocity (When the moving object stop moving)

9. Initial velocity (When the object is at rest then moves)

10. The angle of reflection

(When the incident light ray falls perpendicular on the reflecting surface)

11. Displacement of a moving object

(When it returns back to the starting position)

12. Displacement of a rotating object in a circle

(When it makes integer number of completer revolutions)

13. Initial velocity (when the object stars its motion from rest)

14. Final velocity (When a moving object stops motion)

15. Acceleration of a moving object (according to Newton`s 2nd law)

(When the affecting force vanishes)

16. Horizontal component of initial velocity of a projectile

(when the object projected vertically upward)

17. Horizontal range reached by a projectile

(when the object projected vertically upward)

18. Summation of a number of vectors

(when they are balanced "at equilibrium and cancel each other)

19. The difference of two vectors equal zero

(when they have the same magnitude and act on opposite directions)

20. The cross product of a two vectors

(when the angel between them equal zero as A.B = AB Sin 0 = 0)

21. The dot product of two vectors

(When the angel between them equals 90° As Sin 90=0)

22. Linear acceleration of the body

(when $\sum F=0$ or when the object moves with uniform speed)

8 When these objects equal each other

1. The initial and the final velocity

(When the object moves with regular speed)

2. The final velocity with acceleration for and object moves from rest

(When the time equals 1)

3. The final velocity with the time for an object starts motion from rest

(When the acceleration equals zero)

4. Distance and displacement

(when the object moves in straight line in one direction)

5. The velocity equal numerically the displacement

(When the time taken to cover this displacement

6. Final velocity of an object started motion from rest and time of its motion.

(When the acceleration of this object = unity = 1 m/s^2)

7. Horizontal component of projectile velocity and the vertical component of its velocity

(When the object projected with and angle equals 45° as sin 45 = cos 45)

8. Horizontal range reached by two projectiles which are projected at same initial velocity and different angles

(when the projectiles is projected at complementary angels (angles = 90°)

9. Force and body acceleration (when the mass of the body = 1 kg)

10. The real value and the measured value of a certain physical quantity

(when the error in measurement = 0 , i.e no error in measurement process takes place)

11. The magnitude of the vector product of two vectors equal to their dot product in spite of having an angle between them

(When the object projected with and angle equals 45° as sin 45 = cos 45)

12. Average velocity and instantaneous velocity

(when the object moves with uniform velocity)

9 Mention when does

1. **A body moves with positive acceleration.**

When its speed increases as time passes (i.e its final velocity is greater than its initial velocity)

2. **A body moves with negative acceleration**

   When its speed decreases as time passes (i.e its initial velocity is greater than its final velocity)

3. **A body move with zero acceleration (the acceleration of a moving body banishes)**

   When it moves with uniform (constant) speed

4. **The velocity of a body projected vertically upwards vanishes.**

   When it reaches the maximum height

5. **Force acting on an object makes its velocity increases without changing its direction.**

   When the force acts in the same direction of motion (the angle between the acting force and the direction of motion = 0)

6. **A force acing on an object make its velocity decreases without changing its direction**

   When the force acts in opposite direction of motion

10 What happens when

1. **The scalar (dot) product of two vectors become maximum**

   When the angle between them equals 0 ($\theta=0$) as Cos 0 = 1

2. **The vector (cross) product of two vectors become maximum**

   When the angle between them equals 90 ($\theta=90$) as Sin 90 =1

3. **The initial speed equals the final speed**

   The object moves with uniform speed (acceleration = zero)

4. **The object covers equal distances in equal intervals of time**

   The object moves with uniform speed (acceleration = zero)

5. **A car moves with a speed 100km/h and another car moves with a speed of 100km/h in the opposite direction**

The car seems moving with relative speed equals 200km/h to the observer in the other car

6. **If the driver in a moving car press the brakes**

The car moves with decelerating acceleration (has negative sign) and the final velocity equals zero

7. **An object moves with uniform speed**

Its acceleration = zero

8. **Both directions of velocity and acceleration are negative**

The velocity of the object increases because the acceleration affects in the same direction of velocity

9. **The direction of acceleration is opposite to the direction of velocity**

The object acquires negative acceleration and its velocity decreases

10. **The resultant force acting on a moving body is zero**

The object`s state doesn`t change and it keeps its state of motion with uniform velocity in a certain direction

11. **The force acting on an object vanish**

When its state doesn`t change and this will happen when the sum of forces equal zero)

12. **An object move with constant velocity in a straight line**

When the acting forces acting on it are at equilibrium (When ΣF=0)

13. **A body is projected vertically upwards (concerning its velocity and acceleration)**

Its velocity will decrease gradually until it stops at a certain height

It moves with negative acceleration (called negative free fall acceleration)

14. **Falling of two objects of different masses from the same height at the same moment (ignoring the air resistance)**

They will reach the ground at the same time as they fall under the effect of gravity with the same free fall acceleration

15. **Two projectiles are projected at the same initial velocity where the sum of their angels of projection =90°**

They will reach the same horizontal range

16. **An object projected with an angle of 45°**

It will reach the maximum horizontal range

17. **An object moves with uniform acceleration**

Its velocity increases by equal amounts in equal intervals of time

18. **An object moves with uniform velocity**

It covers equal distances in equal intervals of time and its acceleration = zero

19. **Three forces of different magnitude and directions act on a stationary object.**

The object will move in the direction of resultant of these 3 forces

20. **Two equal and opposite forces act on an object**

The state of the object doesn`t change and it keeps its state of rest or motion with uniform velocity in a certain direction

21. **A force acts on a moving body in the same direction of motion**

The object acquires a positive acceleration in the same direction of force

22. **The object acquires a positive acceleration**

Its speed increases

23. **A force acts on a moving body in the same direction of motion**

The object`s speed will increases as it acquires a positive acceleration

24. **The object acquires a negative acceleration**

Its speed decreases

25. **Cutting off the electric current from a moving fan**

It will continue moving

26. **A static car moves with high velocity suddenly (according to the passengers)**

They will rush backward

27. **A car moving with high velocity stops suddenly (according to the passengers)**

They will rush forward

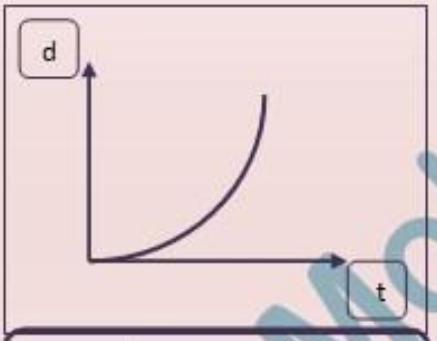
28. **An astronaut projected a small object in a certain direction in space (according to what will happen to the astronaut)**

The astronaut will move back ward with a force equal in magnitude to the projecting force and opposite in direction

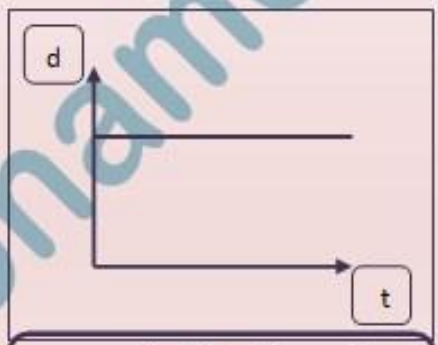
29. **The acting force on a body vanishes.**

It will keep its state without changing or it keeps its state of rest or motion with uniform velocity in a certain direction

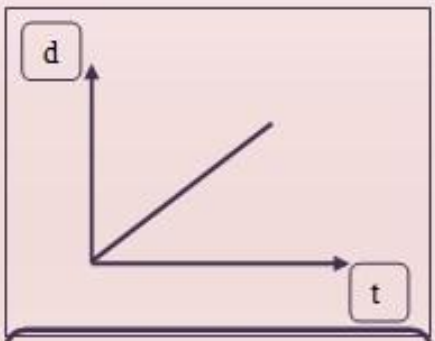
11 EXPLAIN THE FOLLOWING GRAPHS



An object moves with non-uniform speed

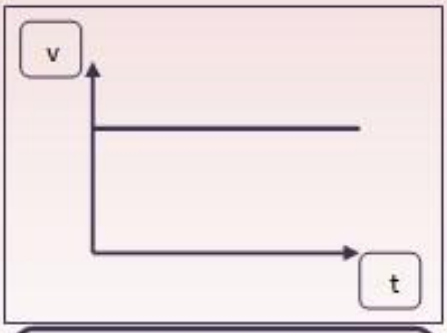


A static object (at rest)

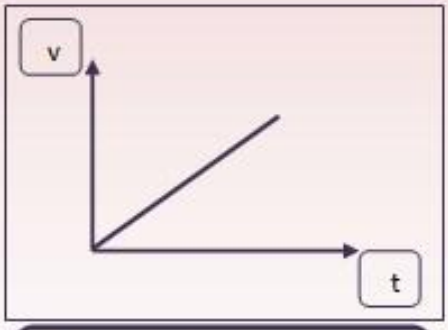


An object moves with uniform speed

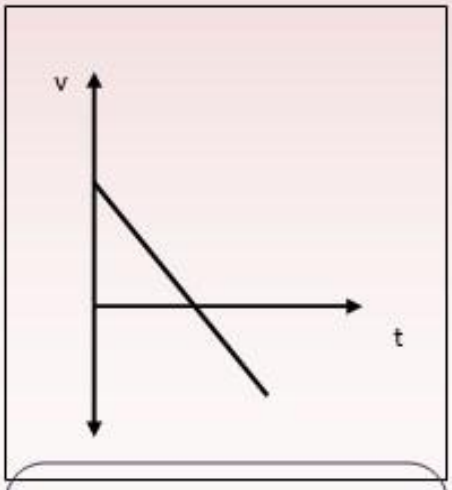
An object moves with non-uniform speed



An object moves with uniform speed (acceleration=zero)

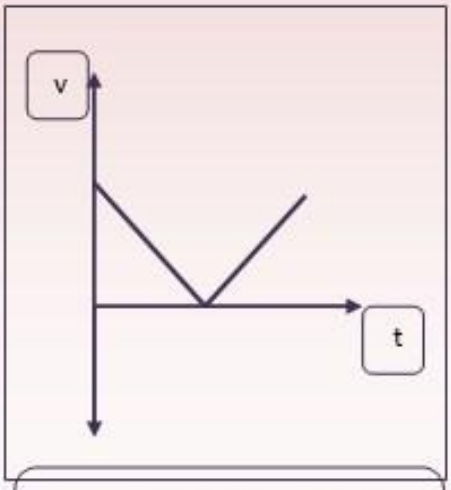


An object moves with non-uniform speed (accelerated motion)



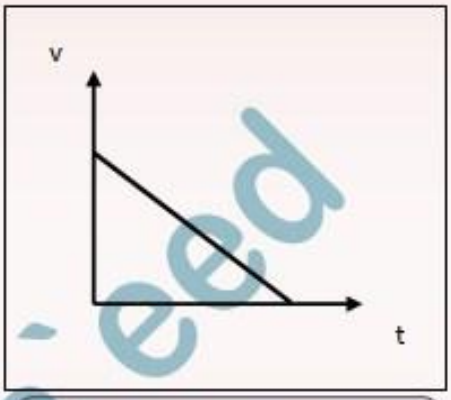
It represents an object its velocity decreases gradually till it stops then it accelerates up but in the opposite direction

(The object moves in two different directions)



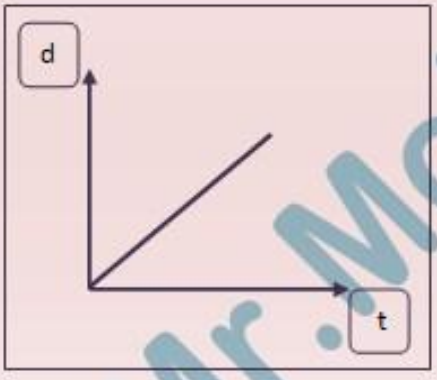
It represents an object its velocity decreases gradually till it stops then it accelerates up but in the same direction

(The object moves in the same direction)



An object moves with decelerated motion

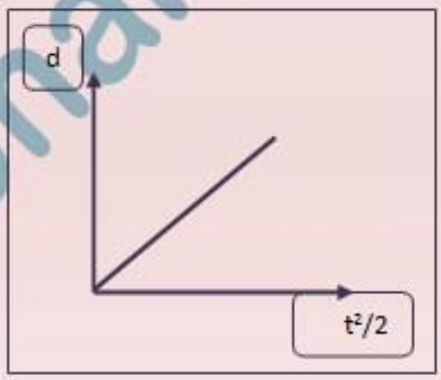
12 WRITE DOWN THE MATHEMATICAL RELATION FOR EACH GRAPH AND STATE WHAT THE SLOPE LINE REPRESENTS:



Relation V=d/t

Slope = Y/X=d/t = v

Slope = velocity

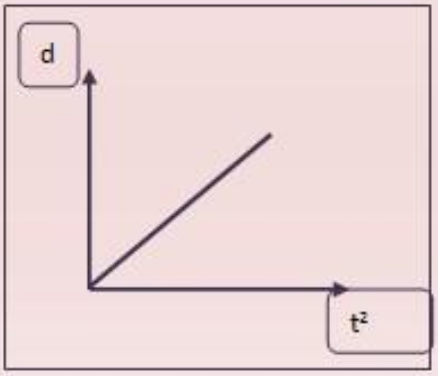


Relation $d=V_it+1/2at^2$

$V_i=0$

Slope = $Y/X=2d/t^2 = a$

Slope = acceleration

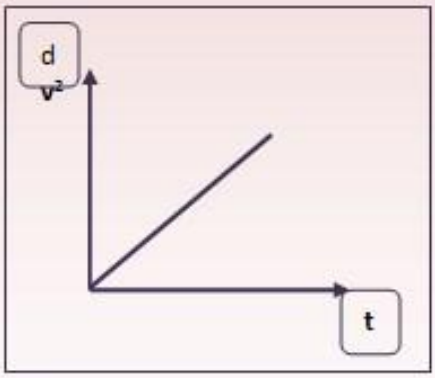


Relation $d=V_it+1/2at^2$

$V_i=0$

Slope = $Y/X=d/t^2 =1/2\ a$

Slope = 1/2 acceleration

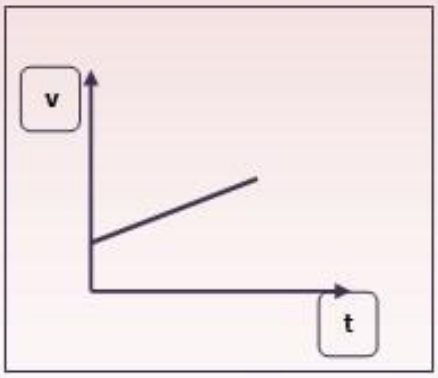


Relation $V_f^2=V_i^2+2ad$

$V_i = 0$

Slope = $Y/X=V_f^2/d = 2a$

Slope = 2 acceleration

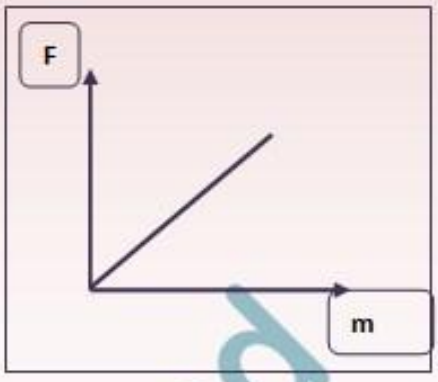


Relation $V_f = V_i + at$

V_i = The intersect part

Slope = $Y/X=\Delta V/t = a$

Slope = acceleration

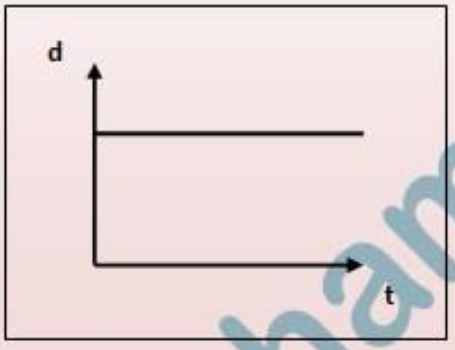


Relation F = ma

Slope = $Y/X=F/m = a$

Slope = acceleration

Newton`s 2nd law



Relation V=d/t

Slope = $Y/X=d/t = v=0$

Slope = velocity = 0

Newton`s 1st law

13 MCq`s questions

CONVERSION BETWEEN PREFIXES

Factor	10^{-15}	10^{-12}	10^{-10}	10^{-9}	10^{-6}	10^{-3}	10^{-2}	10^{3}	10^{6}	10^{9}
Prefix	Femto	Pico	Angstrom	Nano	Micro	Milli	Centi	Kilo	Mega	Giga
Symbol	F	P	°A	n	μ	m	C	K	M	G

1. $7\ m^3$ = …….mm^3

a. 7×10^3 b. 7×10^{-9} c. 7×10^{-3} d. 7×10^9

$$? = \frac{7\ m^3}{mm^3} = \frac{7 \times 1^3}{(10^{-3})^3} = 7\times10^9 mm^3$$

2. 0.8 mg = ……kg

a. 8×10^3 b. 8×10^{-7} c. 8×10^{-3} d. 8×10^7

$$? = \frac{0.8 \times ....}{.....} = \frac{.... \times .....}{.....} = ...x... \ kg$$

3. How many bottles of volume 10000 cm^3 enough to fill a tank of capacity $1m^3$?

a. 1 b. 10 c. 1000 d. 100

Keys of solving

1. Convert units
2. $(Vol)_{tank}$ = No. of bottles X $(Vol)_{bottle}$

NOTE THAT

To add or subtract two physical quantities they should have the same dimensions and same measuring unites

4. The relationship between four physical quantities is given by the equation $P = Q - RS$

Given that the equation is correct, which of the following statements must be correct?

a. P, Q, R and S all have the same units

b. P, Q, R and S are all scalar quantities

c. The product RS has the same units as P and Q

d. The product RS is numerically equal to (Q – P)

5. The coefficient of viscosity (η) of a liquid by the method of flow through a capillary tube is given by the following formula

$$\eta = \frac{\pi R^4 P}{8 l Q}$$

Where R = the radius of capillary tube

l = the length of tube

P = pressure difference between its ends

Q = volume of liquid flowing per second

Which quantity must be measured most accurately?

a. R b. l c. P d. Q

6. If X = 10g and Y = 10kg, then the value of (X + Y) is .....

a. 10.1kg b. 100.1g c. 10.01kg d. 10.01g

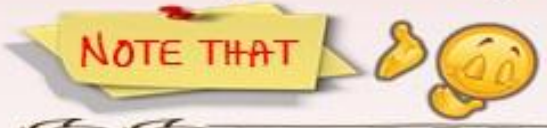
7. If the unit of measuring the pressure is the SI system is $Kg/m.s^2$ so :

a. What is its unit in the French (Gaussian) system?

a. kg.m/s b. $g/cm.s^2$ c. $pound/foot.s^2$ d. $g/foot.s^2$

b. What are its unit in the British system?

a. $kg/m.s^2$ b. $g/cm.s^2$ c. $kg/foot.s^2$ d. $Pound/foot.sec^2$



Be patient before choosing the correct answer

8. If the radius of Hydrogen atom is 0.053 nm, then it is equivalent to .....

a. $0.53x10^{-10}$ m b. $5.3x10^{-11}$ m c. $53x10^{-12}$ m d. all the previous

PHYSICAL QUANTITIES

9. All the following are derived physical quantities except.....

a. Velocity & density b. Speed & Work

c. Time & radius of an atom d. Volume & Acceleration

10. Which of the following is derived physical quantity?

a. velocity, distance & time b. mass, density & volume

c. work, force & distance d. force, volume & density

DIMENSIONAL FORMULA

11. When a beam of light is incident on a surface, it delivers energy to the surface, the intensity of the beam is defined as the energy delivered per unit area per unit time, what is the unit of intensity, expressed in SI base unit?

a. $kg.s^2$ b. $kg.m.s^{-1}$ c. $kg.s^{-2}$ d. $m.s^{-2}$

Answer ?

Light intensity = Energy/area.time = F.d/Area.Time = m.a.d/A.t = m.v.d/A.t = $m.d^2/d^2t^2 = m/d^2$

Measuring unit of light intensity = $Kg.S^{-2}$

12. One property Q of a material is used to describe the behavior of sound waves in the material. Q is defined as the pressure P of the sound wave divided by the speed V of the wave and the surface area A

of the material through which the wave travels Q=P/VA, What are the dimensions and SI units of Q?

a. ML^4T^{-1} & $Kg.m^4.s^{-1}$ b. ML^2T^{-2} & Kg.m.s

c. $M^2L^2T^2$ & $Kg^2.m^2s^2$ d. M^2LT^{-2} & $Kg^2.ms^{-2}$

Answer ?

P=F/A F=ma a=V/t V=d/t $A=d^2$

$Q=P/VA = F/VA^2 = m\ a\ t/d\ d^4 = m\ v\ t/td^5 = m\ v\ /d^5 = m\ d\ /t\ d^5 = m/t\ d^4 = m\ d^4t^{-1}$

Dimensions of $Q = M\ L^4\ T^{-1}$

And the measuring unit is $kg.m^4.sec^{-1}$

13. A metal sphere of radius r is dropped into a tank of water, as it sinks at speed v, it experiences a drag force F given by F=k r v where k is constant, what are the SI base units of k?

a. $m.s^{-3}$ d. $kg.m^{-2}.s^{-2}$ c. $kg^{-1}.m^{-1}s^{-2}$ d. $Kg.m^{-1}.s^{-1}$

Answer ?

$K=F/r\ v = m\ a\ t/r\ d = m\ v\ t/t\ r\ d = m\ v\ /r\ d = m\ d\ /\ t\ r\ d = m/t\ r$

The dimensions of k are $M\ L^{-1}T^{-1}$

So, the measuring units of K are $kg.m^{-1}.sec^{-1}$

14. When a constant braking force is applied to a vehicle moving at speed v, the distance d moved by the vehicle in coming to rest is given by the expression $d=k\ v^2$ where k is a constant

when d is measured in meter and v is measured in meters per second, the constant has a value of K_1 , what is the unit of K_1 expressed in SI base units?

a. m.s b. $m.s^{-1}$ c. $m^{-1}.s^2$ d. $m^{-1}.s^{-2}$

Answer ?

$K_1 = d/v^2 = dt^2/d^2 = t^2/d = t^2.d^{-1}$

So the dimensions of K_1 are $L^{-1}T^2$ Or $M^0L^{-1}T^2$

So the measuring units in SI base system are $m^{-1}.s^2$

15. The average kinetic energy E of a gas molecule is given by the equation $E= 3KT / 2$

Where T is the absolute (kelvin) temperature, what are the SI base units of K?

a. $kg.m^2.s^{-2}$ b. $kg.m^2.s^{-2}.k^{-1}$ c. $kg.m^{-2}.s^{-1}$ d. $kg.m^2.s^{-2}.k$

Answer ?

$K = 2E/3T = 2 F.d / 3T = 2m\ a\ d/3T = 2\ m\ v\ d/3\ t\ T= 2m\ d\ d/3\ t\ t\ T = 2m\ d^2/3t^2T$

CONSTANTS have no UNITS

SO The measuring units of K in SI system are $Kg.m^2.s^{-2}.k^{-1}$

16. If the dimensional formula of the acceleration

Mass = $M = ML^0T^0$

17. If the following dimensional formula ($M^xL^yT^z$) is the dimensional formula of force, so what is the value of (x+y+z)?

a. 0 b. 1 c. 2 d. 4

Answer ?

Dimensional formula of force is (F=ma) $M^{+1}L^{+1}T^{-2}$ so X+Y+Z = +1+1+(-2) = 0

18. If $X = Y^a.Z^b$ and dimensions of quantity X = LT, $Y = L^2T^{-1}$ and $Z = LT^2$, So, the value of (a) and (b) respectively are.....and .....

a. 1/3 & 2/3 b. 1/5 & 3/5 c. 1 & 2 d. -1 & -2

19. Which row in the following table describes the dimensions of the quantities shown in the table?

(Knowing that Dimensions of X is L^2T^{-2} and that of Y is ML^{-1})

Ch	XY	Y / X	X + Y
A	$ML^{-1}T^{-2}$	MLT	MLT^{-2}
B	MLT^{-2}	$ML^{-3}T^{2}$	MLT
C	MLT	MLT^{-1}	Cannot be added
D	MLT^{-2}	$ML^{-3}T^{2}$	Cannot be added

20. The following table shows the dimensions of the physical quantity X, Y, Z and K

The quantity	X	Y	Z	K
Dimensions	LT^{-1}	LT^{-1}	LT^{-2}	T

Which of the following equations may be correct?

a. X = Y + Z + K b. X = Y + ZK c. X = Y.Z.K d. X = ZK / Y

TYPES OF MEASUREMENTS

21. Four students measure the mass of an object, each using a different scale, They record their results as follows:

student	A	B	C	D
Mass	49.06 g	49 g	50 g	49.2 g

Which student used the most precise scale?

a. A b. B c. C d. D

22. The opposite figure shows an ammeter when there is no electric current passing through it, then which of the following figures describes the ammeter when a current of intensity 3A passes through it?

ERROR IN MEASUREMENTS

23. If the volume of a cube is (1000+/-30)cm^3 find the absolute error of the length of the side of the cube.

a. (1000 +/- 1) b. (100 +/- 10) c. (10 +/- 0.1) d. (1 +/- 0.01)

Answer ?

Volume = L^3 = 1000 **L_o = 10 cm** **ΔVol = 30**

$$r_{vol} = \Delta v_{ol}/v_{ol} = 30/1000 = 0.03$$

$$r_{vol} = r_{LXLXL} = r_L . r_L . r_L = 3\ r_L$$

$$0.03 = 3\ r_L \qquad r_L = 0.03/3 = 0.01$$

$$r_L = \Delta L/L_O \qquad 0.01 = \Delta L/10 \qquad \Delta L = 10 \times 0.01 = 0.1$$

$$L = (10+/-0.1)$$

24. The relative error in measuring resultant force acting on a body is 4%, if the relative error in measuring mass is 2%, calculate the relative error in measuring the acceleration f the body?

a. 1 % b. 2 % c. 3 % d. 4 %

Answer ?

$r_F = 0.04$ $r_m = 0.02$ $r_a = ?$

$$r_F = r_{ma} = r_m + r_a$$

$$0.04 = 0.02 + r_a$$

$$r_a = 0.04 - 0.02 = 0.02 = 2\%$$

25. A student measured the door LENGTH and he found it equals 250 cm while the real value was 255 cm calculate the absolute error and the relative error for his measurement.

a. 1.25 % b. 2.35 % c. 3.01 % d. 1.96 %

Answer ?

$\Delta X = |X_o - X|$ $\Delta X = |255 - 250| = 5$ Cm $r_x = \Delta X/X_o = 5/255 = 1.96\ \%$

26. When measuring the AREA of a swimming pool it was found to be 22m2 while the real area equals 22.4 m2 calculate the absolute error and the relative error for this measurement.

a. 1.25 % b. 1.78 % c. 2.01 % d. 1.96 %

Answer ?

$\Delta A = |A_o - A|$ $\Delta A = |22.4 - 22| = 0.4\ m^2$

$r_A = \Delta A / A_o = 0.4/22.4 = 1.78\ \%$

27. Find the relative error in estimating the volume of a cuboid if the results of measuring the results of measuring its dimensions are as follows:

Dimensions	Measured quantity (cm)	Real quantity (cm)
Length (X)	5.2	5.23
Width (Y)	4.5	4.56
Height (Z)	2.9	2.95

a. (50 +/- 1.02) b. (70.35 +/- 1.31)

c. (20 +/- 2.1) d. (60 +/- 1.25)

Answer ?

$V_o - r_v - \Delta V$

V_o = Real Length x Real width X Real height = $X_o Y_o Z_o$

$V_o = 5.23 \times 4.56 \times 2.95 = 70.35$

$r_v = r_{xyz} = r_x + r_y + r_z$ $r_v = \Delta X/X_o + \Delta Y/Y_o + \Delta Z/Z_o$

$r_v = |5.23-5.2|/5.23 + |4.56 - 4.5|/4.56 + |2.95-2.9|/2.95$

$r_v = 0.0057 + 0.013 + 0.0169 = 0.0187$

$\Delta V = r_v . V_o = 0.0187 \times 70.35 = 1.31$

Volume = (70.35+/-1.31)

28. If x=(5+/-0.1) cm and y=(10+/-0.2) cm calculate:

a. x+y b. 2x+y c. xy d. xy^2

Answer ?

a. X+Y

$\Delta(X+Y) = \Delta X + \Delta Y = 0.1+0.2 = 0.3$ cm

$r_{(X+Y)} = \Delta (X+Y)/(X+Y)_o = 0.3/(5+10) = 0.2$Cm

b. 2X+Y

$\Delta(2X+Y) = 2\Delta X + \Delta Y = 0.2+0.2 = 0.4$ cm

$r_{(2X+Y)} = \Delta (2X+Y)/(2X+Y)_o = 0.4/(10+10) = 0.02$Cm

c. XY

$XY = 5X10 = 50\ cm^2$

$r_{XY} = r_x + r_y = \Delta X/X_o + \Delta Y/Y_o = 0.1/5 + 0.2/10 = 0.22$

$\Delta xy = r_{xy}.X_oY_o = 0.22 \times 50 = 11$

$XY = (50 +/- 11)$

d. XY^2

$XY^2 = 5X10X10 = 500\ cm^2$

$r_{XYY} = r_x + r_y + r_y = \Delta X/X_o + 2\Delta Y/Y_o = 0.1/5 + 0.4/10 = 0.24$

$\Delta XYY = r_{xyy}.X_oY_o^2 = 0.24 \times 500 = 120$

$XY^2 = (500 +/- 120)$

NOTE THAT

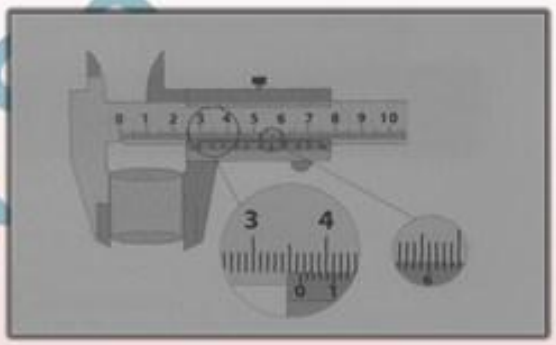
- The relative error (r_x) is most accurate method to find the error in measurements.
- The most accurate measurement that has the least relative error value.

29. A student measured some physical quantities in his room and he gets the following results, So, which of them is more accurate?

Ch.	Physical quantity	Its value	r_x
A	The rom length	(6 +/- 0.05) m	
B	The room width	(4 +/- 0.05) m	
C	The room height	(3.5 +/- 0.05) m	
D	The room temperature	(30 +/- 0.5) °C	

How to use vernier caliper

30. The opposite figure illustrates a vernier caliper used to measure the radius of a metallic cylinder, From the figure find:



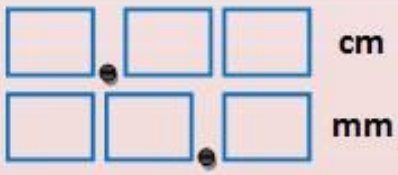
(a) The measured value for the thickness of the cylinder (in cm).

a. 3.01 b. 3.66 c. 3.06 d. 3.41

(b) The relative error for that measurement if the actual value of the radius of the cylinder is 3.68 cm.

a. 0.543% b. 0.42 %

c. 0.306% d. 0.631 %



Scalar and Vector physical quantities

31. Which of the following sentences describes a fundamental scalar quantity?

a. The weight of a man is 800 N

b. A girl moves a displacement 80 m to east

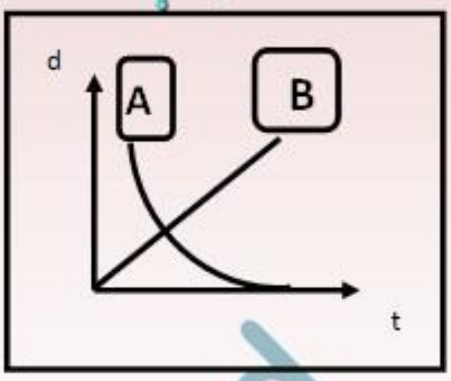
c. The kinetic energy of a car is 500 J

d. The mass of a piece of iron is 60 kg

32. A moving car on a straight line with uniform speed as it passes the sign 151 km at 8 o`clock and it passes the sign 316 km at 10 o`clock, calculate the speed of this car?

a. 82.5 km/h b. 75.25 km/h c. 60.3 km/h d. 21.6 km/h

33. a. Which of them moves towards the building and which of them moves away from the building?



a. A b. B c. Both of them d. non of them

b. Which of them moves with uniform speed and which of them moves with irregular speed?

a. A b. B c. Both of them d. non of them

c. Which of them reaches the end point first?

a. A b. B c. Both of them d. non of them

34. A football player at the corner of the playground tries to reach a ball at a distance of 50m away from him and his maximum speed is 3m/s while there is another player at a distance of 35m from the ball tries to reach it, who will reach the ball first? Why?

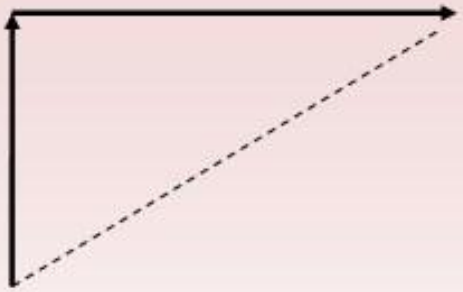
a. The1st player as the time taken by the 1st player = 16.7 sec

b. The 2nd player as time taken by the 2nd player = 16.5 sec

c. The1st player as the time taken by the 1st player = 10.75 sec

d. The 2nd player as time taken by the 2nd player = 20.5 sec

35. An object moves from point "A" to cover 30 m in north direction until it reaches point "B" in 3 sec then it moves from 40 m in 4 sec calculate:



a. The distance covered by the object

a. 30m b. 40m c. 50m d. 70m

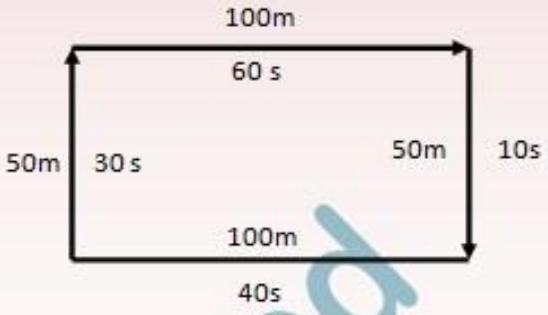
b. The displacement

a. 30m b. 40m c. 50m d. 70m

c. The average speed

a. 7.14 m/s b. 4 m/s c. 5.02 m/s d. 4.7 m/s

36. A racer covered 50m northward within 30 s, then 100m eastward within 60s, then 50m southward within 10 s and then returns back to the start point within 40 s:



a. How long is the total distance the racer moved?

a. 100 b. 200 c. 300 d. 500

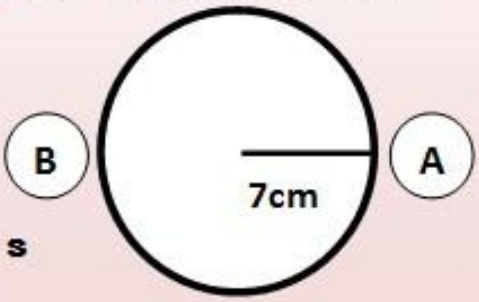
b. what is the average speed of the racer?

a. 3.21 m/s b. 2.14 m/s c. 4.02 m/s d. 0

c. what is the displacement ? and the average velocity?

a. 0 – 0 b. 2.14 m/s – 0 c. 0 – 2.14 m/s d. 2.14 m – 2.14 m/s

37. An object moves on the perimeter (circumference) of a circle its diameter is 14 cm calculate:

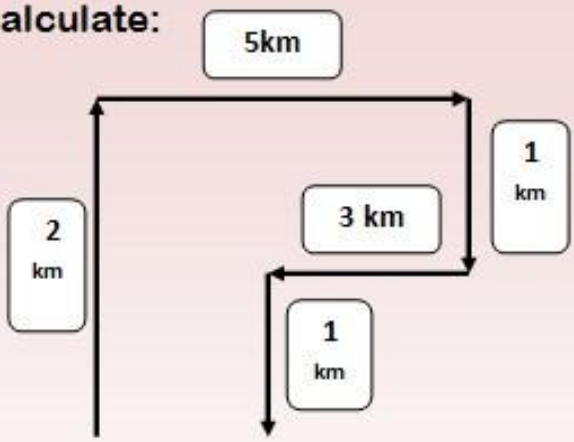


a. The distance and the displacement covered when it moves from position A to position B.

a. 22m – 14 m b. 22 s - 14 s

c. 14 m – 22s d. 14s – 22 m

38. The opposite figure represents a car starts its motion from point A to point F passing by points B,C,D and E calculate:



a. Total distance that the body covered

a. 2 b. 12 c. 10 d. 15

b. Displacement

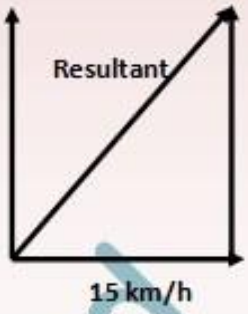
a. 2 b. 12 c. 10 d. 15

c. Velocity if it takes 10 sec

a. 0.2 km/s b. 2 km/s c. 1.2 km/s d. 12 km/s

VECTOR REPRESENTATION, RESULTANT, ALGEBRA AND PRODUCT

39. A ship sails to North at velocity 12 km/h due to tide, it is deviated to east at velocity 15 km/h, so, the magnitude and direction of resultant velocity of the ship = ...



a. 31.2 km/h - θ = 15° b. 20.6 km/h - θ = 33°

c. 19.2 km/h - θ = ° d. 12.5 km/s - θ = 22°

40. Two forces $F_1 = F_2$ act on an object, if their resultant has magnitude 20 N and makes an angle of 45o to x-axis find,

a. The magnitude of each of $\overrightarrow{F_1}$ and $\overrightarrow{F_2}$

a. 14.14 – 200 b. 14.14 – 14.14 c. 200 – 14.14 d. 14.14 - 200

b. The dot product = ...

a. 200N b. 400N c. 300N d. 141.38 N

c. The cross product of the two forces = ...

a. 200N b. 400N c. 300N d. 141.38 N

41. A vector quantity V is resolved into two perpendicular components X and Y the angle between V and component X is Θ,

Then angle between component X and vector V is increased from 0 to 90 ° how do the magnitude of X and Y change as the angle Θ is increased in this way?

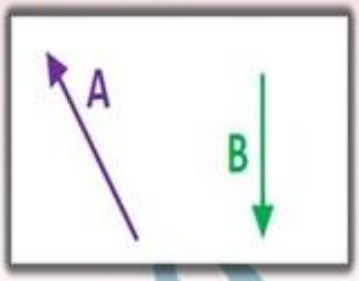
	X	Y
A	Increase	Increase
B	Increase	Decrease
C	Decrease	Increase
D	Decrease	Decrease

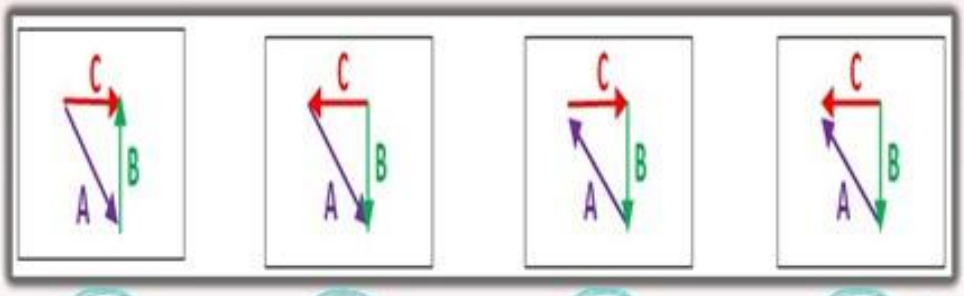
Explanation

By increasing θ , Cos θ decreases as X = V Cos θ so X decreases

By increasing θ , Sin θ increases as Y = V Sin θ so X increases

42. The sum of these two vectors is.....





A B C D

43. If vector A and vector B are parallel, So, their .....= zero.

a. A^B b. A.B c. A + B d. A - B

44. Two parallel equal forces (F), their resultant = ...N and it makes angle = ...° with the horizontal.

a. 1.41 F – 30° b. 4.01 F – 45° c. 1.41 F – 45° d. 4.01 F - 30

45. The value of vector product of two vectors also their sum vanish if the two vectors .....

a. have the same value and the angle between them = 180°

b. have the same value and the angle between them = 0°

c. have the same value and the angle between them = 45°

d. have the same value and the angle between them = 90°

46. If the dot product of two vectors A and B = 80, and their cross product = 100, So:

a. The angle between them = ...°.

a. 45° b. 51.53° c. 38.56° d. 21.25°

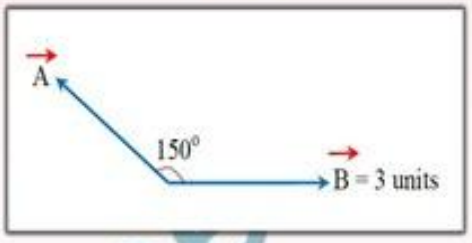
b. If vector A = Vector B so the value of $A + B^2$ = ...

a. 172.76 b. 120 c. 150 d. 139

47. The horizontal component F_x is equivalent to the vertical component F_y when their resultant makes angle .....with the horizontal.

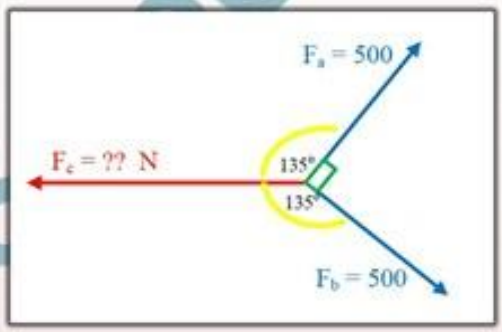
a. 30 b. 45 c. 60 d. 90

48. If the resultant of the two vectors A and B is perpendicular on vector B, So, the value of vector A = ...units.



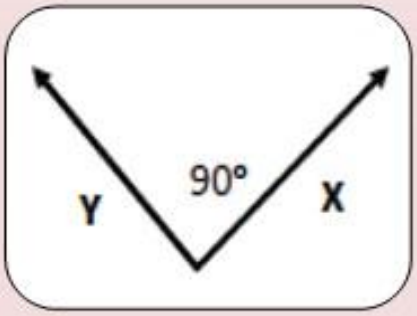
a. 3.46 b. 3 c. 2.25 d. 2

49. In one of tug war game, two teams A and B pull the cord together and the angle between them was 90° against another team C as in figure, so, the force of team C to make the cord balanced = ...N.



a. 500 b. 707 c. 250 d. 1000

50. The opposite figure shows two vectors X and Y that are equal in magnitude, the angle between them = 90O which of the following mathematical operations equals zero:



a. Their addition (X+Y)

b. Their subtraction (X-Y)

c. Their dot (scalar) product (X.Y)

d. Their cross (vector) product (X^Y)

51. The vector product and resultant of two vectors vanish when .....

a. The two vectors are equal and the angle between them is 180°

b. The two vectors are equal and the angle between them is 0°

c. The two vectors are equal and the angle between them is 45°

d. The two vectors are equal and the angle between them is 90°

52. If two forces are perpendicular and equal in magnitude so their resultant equals.....

a. F b. 2 F c. F √2 d. 1/2 F

53. All the following mathematical expressions are correct except.....

a. $\vec{A}.(\vec{B}.\vec{C})$ b. $\vec{A}\wedge(\vec{B}.\vec{C})$ c. $\vec{A}\wedge(\vec{B}\wedge\vec{C})$ d. $5+(\vec{B}.\vec{C})$

54. All the following mathematical expressions are wrong except.....

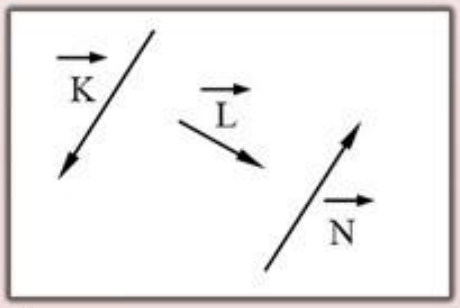
a. $5+(\vec{B}\wedge\vec{C})$ b. $5+\vec{A}$ c. $5+\vec{A}$ d. $\vec{A}+(\vec{B}.\vec{C})$

55. The horizontal and vertical components of the displacement covered by superman in the opposite figure equals .....m and .....m respectively.

a. 86.6 - 50 b. 70 – 100

c. 50 – 100 d. 100 - 70

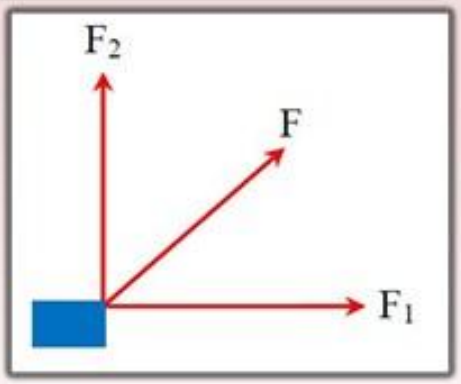
56. K, L and N are three vectors, so, which of the following equations is incorrect?



a. $\vec{K}+\vec{N}=0$ b. $\vec{K}-\vec{N}=2\vec{K}$

c. $\vec{K}=\vec{N}$ d. $\vec{K}+\vec{N}+\vec{L}=\vec{L}$

57. F_1 and F_2 are two perpendicular forces, So, the value of their resultant F .....



a. equals $F_1 + F_2$

b. Greater than $F_1 + F_2$

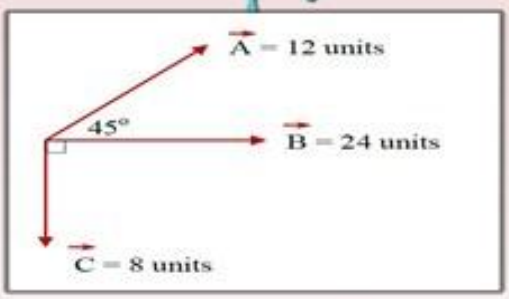
c. equals $F_1 - F_2$

d. less than $F_1 + F_2$

58. If two physical quantities A and B have different dimensions, so, which of the following mathematical equations has physical meaning?

a. A + B b. A – B c. AB d. B - A

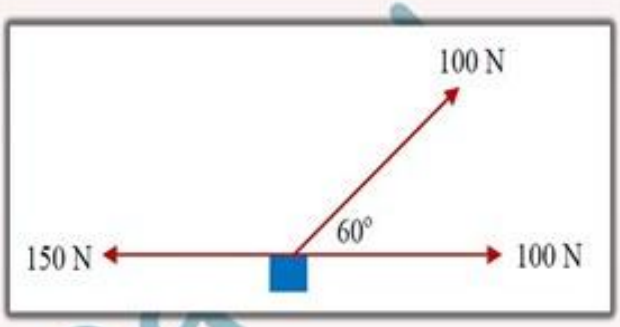
59. From the following figure, the value of A ^ C equals .....



a. 35.35 b. 65.25

c. 67.88 d. 96

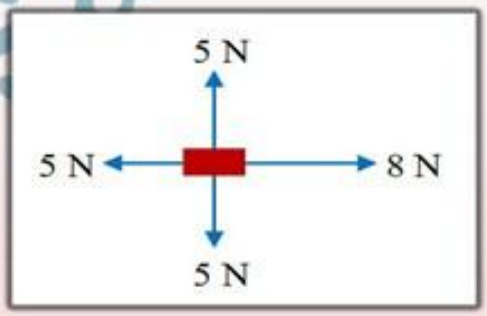
60. The following figure represents three forces acting on a static box, so, there resultant = ... and it makes angle ....° with the horizontal.



a. 37.2 - 60 b. 65.3 - 30

c. 0 - 90 d. 86.6 – 90°

61. From the following figure, the value of the resultant force = ...N.



a. 0 - east b. 8 - west

c. 3 - east d. 3 - west

62. If vector A = 5 units and its direction is towards north, and vector B = 2 units and its directions is towards south, so, (2A – B) equals.....

a. 12 units towards south b. 8 units towards south

c. 12 units towards north d. 8 units towards north

63. Three forces of magnitudes 5N, 4N and 3N are in equilibrium, What is the approximate angle between the 5 N force and the 3 N force?

d. 127° c. 90° b. 53° a. 37°

64. Two forces of magnitudes 4N and 6N are applied to a point, which one of the following could not be the magnitude of their resultant?

a. 1 N b. 4 N c. 8 N d. 10 N

65. Which of the following is a unit of force?

a. N m b. mN c. nm d. N s

66. If a ball is projected with an angle (θ) with the horizontal, then it was projected with and angle (90- θ) with the vertical, so which of the following is correct?

a. The ball takes longer time in case of angle (θ) to reach maximum horizontal range

b. The ball takes longer time in case of angle (90-θ) to reach maximum horizontal range

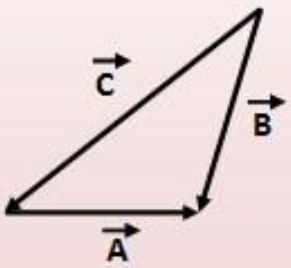
c. The ball reaches the same height in both cases

d. The ball reaches longer horizontal range in case of angle (θ)

67. If the angle between two vectors A and B = 44°, So, the ratio between their vector product to their scalar product .....

a. more than 1 b. less than 1 c. equals 1

68. Which of the following choices describes the opposite figure?

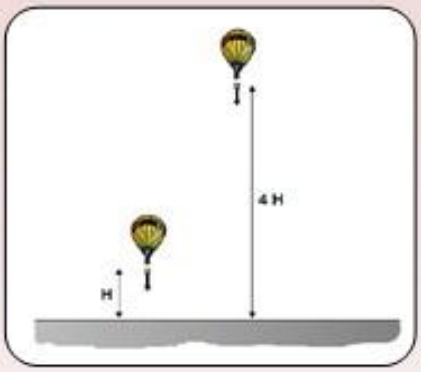


a. $\vec{A} + \vec{B} = \vec{C}$ b. $\vec{B} + \vec{C} = \vec{A}$

c. $\vec{C} + \vec{A} = \vec{B}$ d. $\vec{A} + \vec{B} + \vec{C} = 0$

ACCELERATION AND EQUATIONS OF MOTION

69. A box dropped from a balloon twice the first time, the distance between the balloon and the surface of the earth H, while in the second time the distance was 4H The time taken by the box to reach the Earth's surface in the second case compared to that of the first case equals.....



A. Time is one in both cases because it does not depend on altitude.

B. Time in the second case is twice the time in the first case.

C. Time in the second case is three times the time in the first case.

D. Time in the second case is four times the time in the first case.

70. Ahmad and Fady stood on the edge of a rocky cliff overlooking a lake. Ahmed threw a basketball head up, at the same time Fady threw another basketball head down as fast as the primary, If you are standing in a boat under the rocky shelf watching what they are doing, which ball will hit the water surface more quickly?

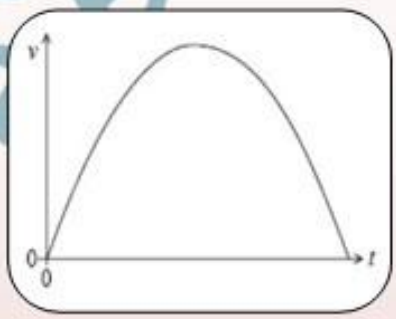
a. Ahmed's ball.

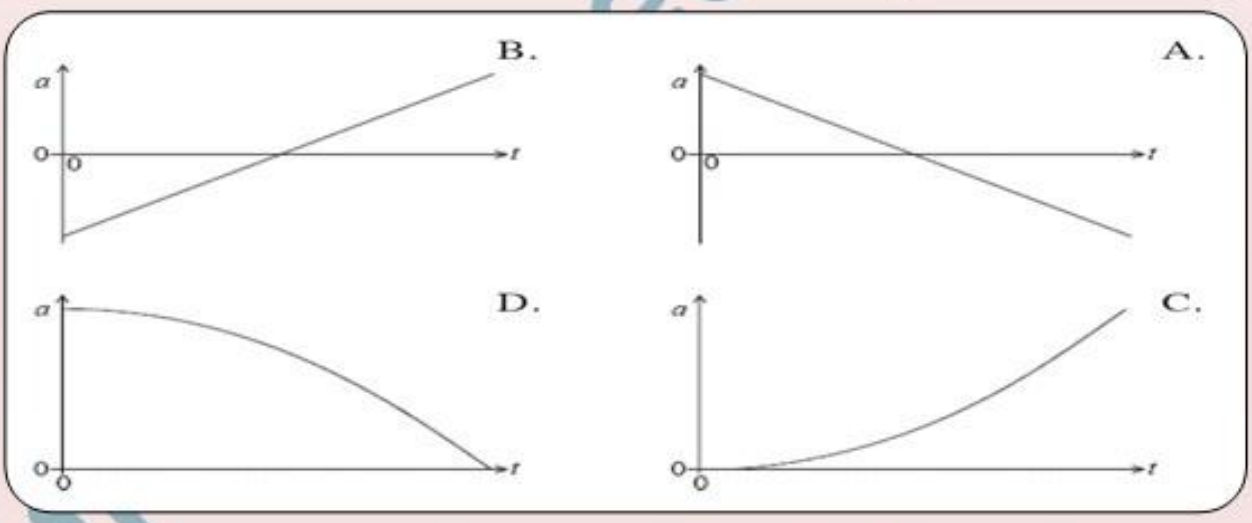
B. Fady`s Ball.

C. Both basket balls will reach the surface of the water at the same speed.

D. There is not enough information to answer

71. The opposite figure shows the change in velocity of an object (v) that moves in straight line with time (t), Which of the following graphs represents the change in acceleration with time for this object?





72. Mazen moves with uniform (regular) speed of 1m/s for 10 minutes then he runs with uniform speed of 4m/s for 5 minutes calculate Mazen`s average speed through the whole 15 minutes?

a. 1 m/s b. 2 m/s c. 4 m/s d. 6 m/s

73. If a car is moving in a straight road to cover 1/3 of the distance at velocity of 25 Km/h and the rest of the distance was covered at velocity of 75 Km/h , calculate the average velocity of the car?

a. 45 km/h b. 60 km/h c. 75 km/h d. 100 km/h

74. A person projected a stone upwards at an angle 30° to the horizontal, the stone returned to the same plane 10 seconds later, given that free fall acceleration 9.8 m/s^2 find:

a. The vertical component of its velocity on projection = ...m/s.

a. 35 b. 49 c. 75 d. 98

b. The horizontal component of velocity on projection = ...m/s.

a. 21.2 b. 33.4 c. 49 d. 52.3

c. Maximum height reached by the stone = ...m.

a. 210.2 b. 133.4 c. 249 d. 122.5

75. A train driver applied the brakes when the train was moving at 20 m/s to stop the train in a minute calculate the acceleration and distance moved till stopping.

a. 210 b. 606 c. 249 d. 450

76. A rescue plane flying at 500 m high above a certain spot, the plane dropped a box of food supplies to some people find:

a. The box velocity after falling a distance of 50 m = ...m/s.

a. 21.5 b. 42.2 c. 31.3 d. 45.6

b. The distance fallen by the box after 7 sec = ...m.

a. 240.1 b. 600.3 c. 351.2 d. 450.8

c. The time taken till the box reaches that spot (g=9.8 m/s2) = ...s.

a. 21.3 b. 10.1 c. 15.6 d. 8.25

77. An object falls from a tower to reach the ground 6sec later, if the free fall acceleration 9.8 m/s^2 find:

a. The object velocity when reaching the ground = ...m/s.

a. 58.8 b. 62.1 c. 45.6 d. 81.25

b. The tower height = ...m.

a. 421.3 b. 221.1 c. 115.6 d. 176.4

78. An object is moving according to the relation t = 1/2 Vf – 6 find

a. The initial velocity of the object = ...m/s.

a. 21 b. 12 c. 15 d. 17

b. The acceleration of the object motion = ...m/s^2.

a. 2 b. 3 c. 4 d. 6

c. The distance covered by the object in 10 sec = ...m.

a. 115 b. 220 c. 125 d. 176

79. An object is moving in a straight line according to the relation Vf = $\sqrt{36+5d}$ find

a. The initial velocity of the object = ...m/s.

a. 2 b. 4 c. 6 d. 8

b. The acceleration of the object = ...m/s^2.

a. 1.5 b. 2 c. 2.5 d. 3

c. Displacement of object after 10 sec = ...m.

a. 185 b. 220 c. 125 d. 176

d. Displacement of object when its velocity reaches 20 m/s = ...m.

a. 66.5 b. 72.8 c. 89.3 d. 76.8

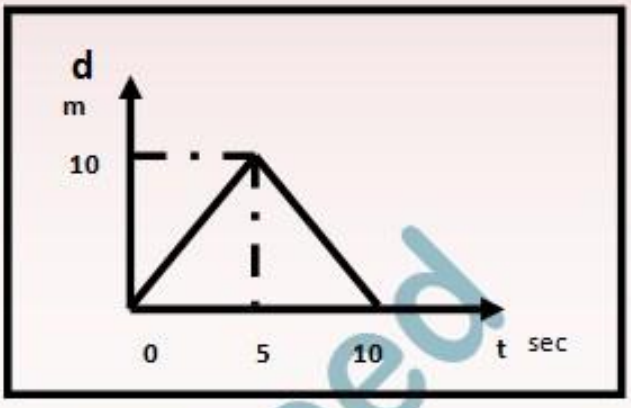
e. The object velocity after 15 sec = ...m/s.

a. 22.5 b. 22.6 c. 43.5 d. 56.2

80. If an object starts motion from rest and takes time (t) which is numerically equal to the magnitude of its uniform acceleration to reach a final velocity of 16 m/s calculate the magnitude of its uniform acceleration = ...m/s^2.

a. 2 b. 4 c. 6 d. 8

81. In the following graph, calculate:



a. Total distance = ...m.

a. 0 b. 10 c. 20 d. 40

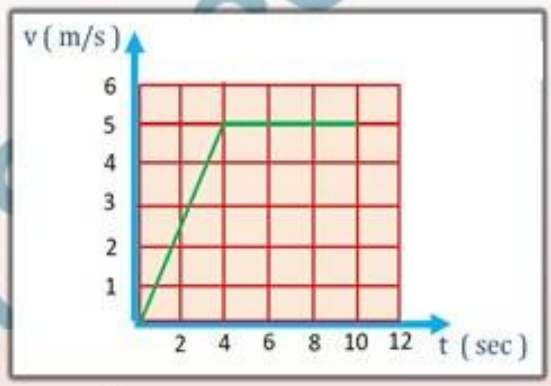
b. Displacement = ...m.

a. 0 b. 10 c. 20 d. 40

c. Speed at first 5 sec = ...m/s.

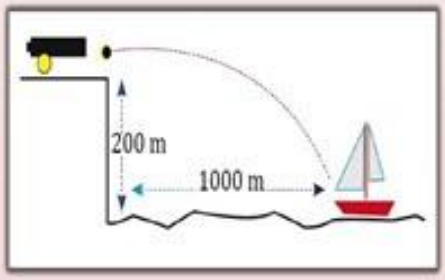
a. 0 b. 1 c. 2 d. 50

82. In the following graph, the object covers 40m within 10 sec, So, the acceleration = ...m/s^2.



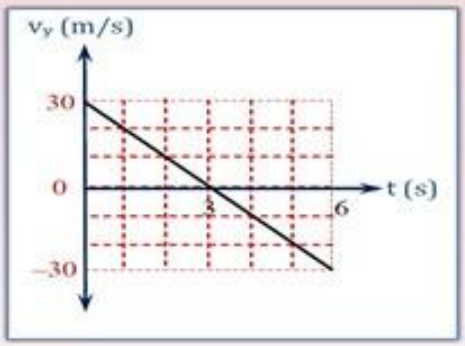
a. 5 b. 1.2 c. 0.5 d. 10

83. From the following figure, the velocity of projection (V_i) = ...m/s.



a. 30 b. 60 c. 90 d. 120

84. The following graph represents the vertical component of object`s velocity under gravity, So, if the angle of projection = 30° find:

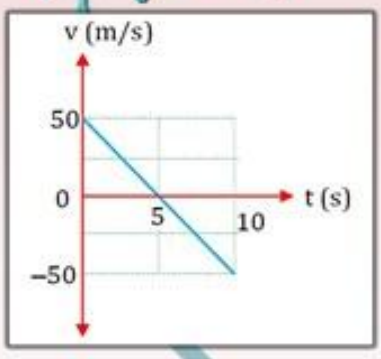


1. The initial velocity of projection = ...m/s.
2. Maximum height = ...m.
3. Maximum horizontal range = ...m.

85. An object is projected twice, once with speed V and another with speed V/2 with the same angle of projection and from the same height, So, the ratio between the maximum horizontal range in the first case to that of the second = ...

a. 1 : 2 b. 1 : 4 c. 2 : 1 d. 4 : 1

86. From the following graph, find: ($g = 10\ m/s^2$)



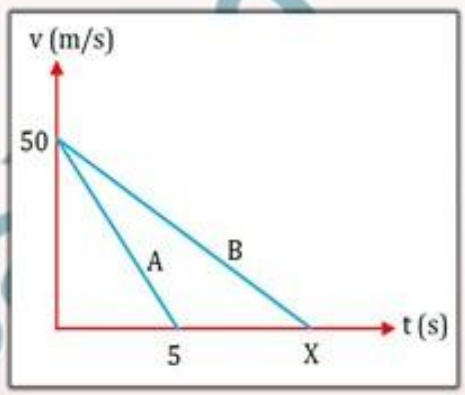
a. The time taken by the object to reach maximum height = ...s.

a. 5 b. 10 c. 15 d. 20

b. The maximum height = ...m.

a. 50 b. 125 c. 150 d. 200

87. From the following graph, represents two objects A and B, one of them is projected on Earth while the other is projected on Moon (Knowing that acceleration due to gravity on moon = one sixth that of the Earth), Answer:



a. Which line represents the object that is projected on moon?

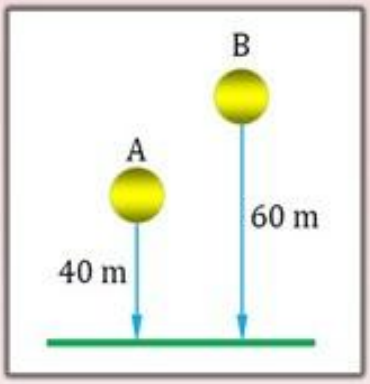
a. A b. B c. Cannot be defined

b. If the mass of the object increases to double its value, what will happen to the slope of the two lines?

a. A decreases while B increases b. decrease

c. A increases while B decreases d. increase

88. Object A falls freely and at the same moment object B is thrown downward by an initial velocity V, so, the two objects reach the Earth at the same time, so, the value of V = ...m/s.



a. 7.05 b. 2.83 c. 4.12 d. 8.02

89. Two objects A and B falls freely under the effect of Earth`s gravity, if mass of object A is double that of object B So, the ratio between their acceleration $a_a : a_B$ = ...

a. 1 : 1 b. 1 : 2 c. 2 : 1 d. 1 : 4

90. A canon shell is projected with angle 15° then it reaches a horizontal range R then we should rotate the canon anticlockwise by

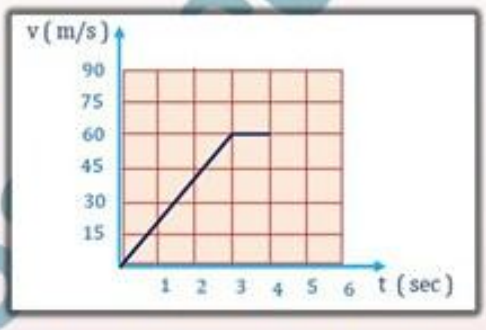
angle .....to let the projectile reaches the same horizontal range R.

a. 75 b. 60 c. 15 d. 90

91. The time required for an airplane to stop during its landing if you know that its speed at the moment that it touches the ground = 50 m/s and it decelerates by 2 m/s^2 is .....sec.

a. 10 b. 15 c. 20 d. 25

92. The following graph represents the relation between object`s speed and time, so the distance covered by the object within 4 sec = ...m.

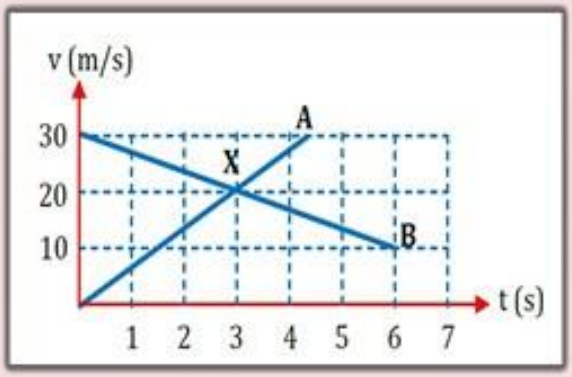


a. 60 b. 90 c. 150 d. 200

93. The final velocity of an object start its motion from rest is numerically equivalent to its acceleration after time .....sec.

a. 1 b. 2 c. 3 d. 4

94. The corresponding graph shows the relationship between the speed of movement of two bodies A and B and time. Which of the following statements is true?



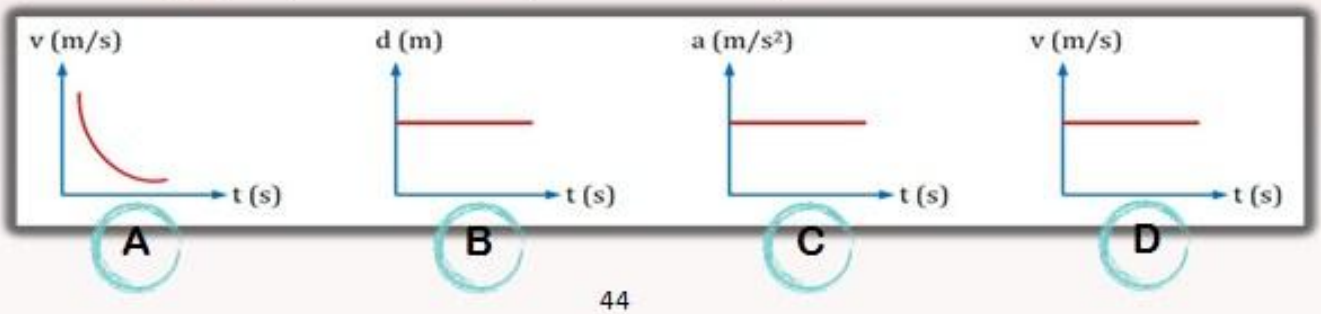
a. The two bodies move at a constant speed

b. Both bodies move with a positive acceleration

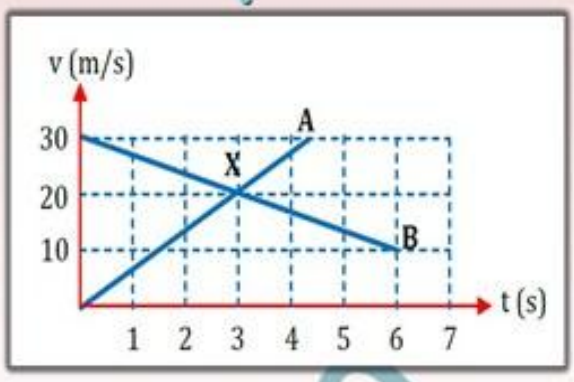
c. The average velocity of the two bodies is one after 3 seconds

d. The instantaneous velocity of the two bodies is the same at 3 seconds

95. Which graph represents an object moves with positive uniform acceleration?



96. The corresponding graph shows the relationship between the speed of movement of two bodies A and B and time. Which of the following statements is true?



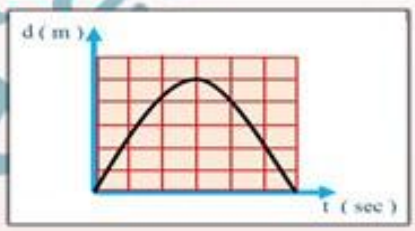
a. Speed of object A increases while that of object B decreases

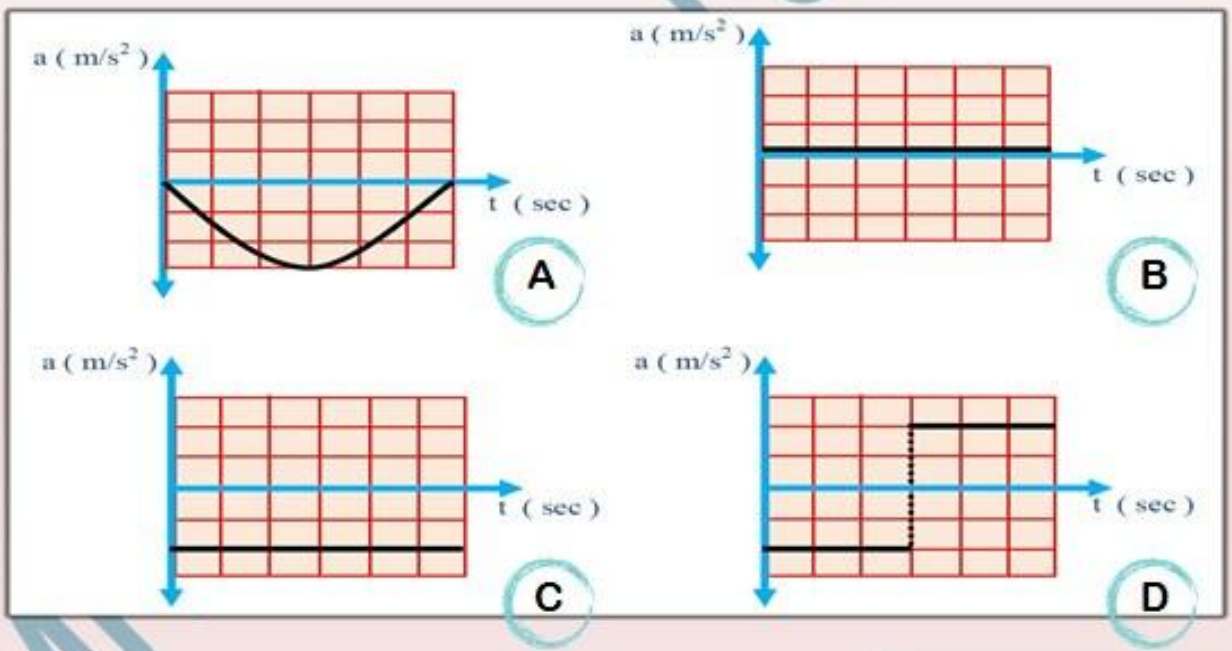
b. acceleration of object A greater than B

b. acceleration of object A and B are in the same direction.

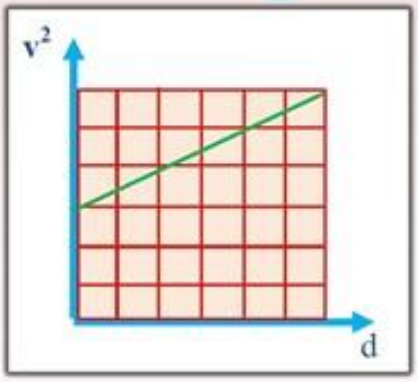
d. The two objects meet at the same position after 3 sec.

97. The following graph represents the relation between displacement covered and time for an object throw upward, so, the graph that represents its motion is .....





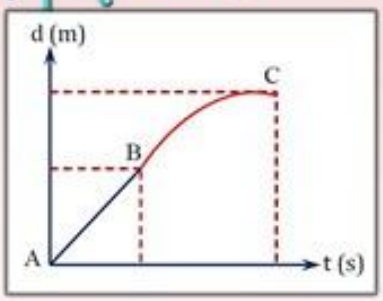
98. From the following graph, intersecting part = ...and the slop = ...



a. $V_i - 2a$ b. $V_i - 0.5\ a$

c. $V_f - 2a$ d. $V_f - 0.5\ a$

99. The following graph represents the relation between displacement and time for an object, so which of the following sentences is correct?



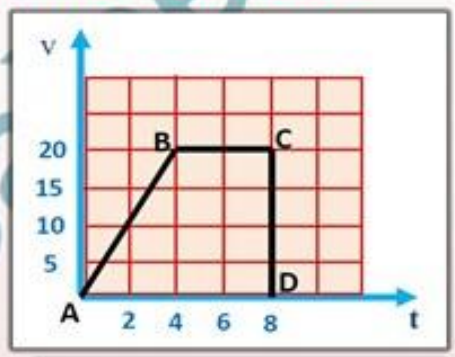
a. The object is at rest at period BC

b. The object moves with positive acceleration within period AB

c. The object`s speed increases uniformly within period AB

d. The object moves with Negative acceleration within period BC

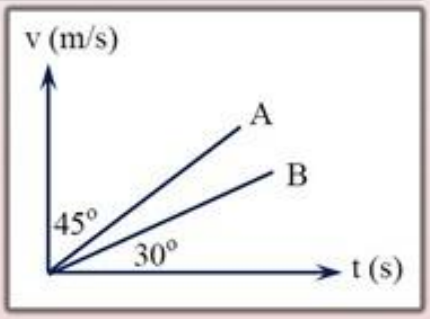
100. From the opposite graph, the displacement covered = ...m.



a. 160 b. 80

c. 120 d. 100

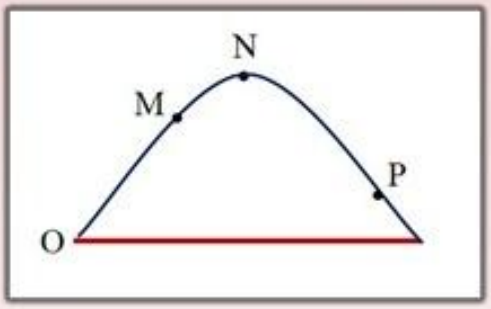
101. From the following graph, the ratio between $a_A : a_B$ = ... : .....



a. 0.5 b. $\sqrt{3}$

c. 2 d. 0.25

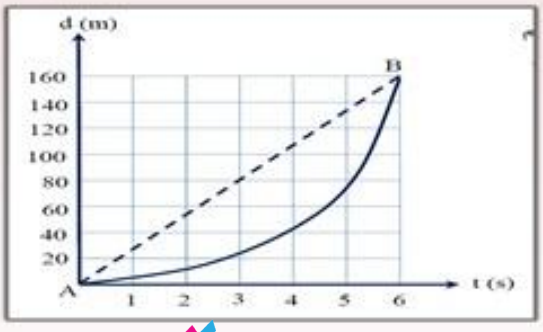
102. A player throw a ball from point O, then arrange the speed of the ball in points M, N and P ascending?



a. M = N = P b. N < M < P

c. N > M > P d. P > N > M

103. The slop of dash line AB .....



a. greater than average speed within 6 s

b. less than average speed within 6 s

c. less than average speed at the 2nd s

d. equals instantaneous speed at 2nd s

NEWTON'S 1ST AND 3RD LAWS

104. A static book on a shelf and affects by a force downward, So, the reaction of this force is .....

a. The force by which the Earth affects the book

b. The force by which the shelf effects on the book

c. The force by which the Earth affects the shelf

d. The force by which the book affects the Earth

105. A car moves with uniform speed of 120 km/h under the effect of force of the car engine F_1 and friction force F_2 then.....

a. $F_1 = F_2$ b. $F_1 < F_2$ c. $F_1 > F_2$ d. no correct answer

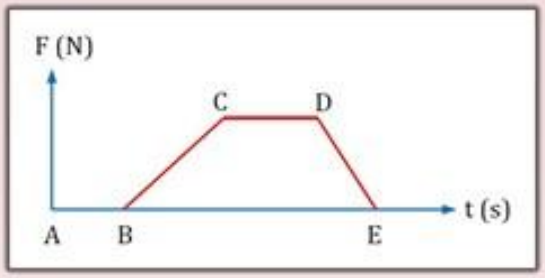
106. A car moves with uniform speed of 120 km/h under the effect of force of the car engine F_1 = 1500N then the resultant force = ...N.

a. 0 b. 750 c. 1000 d. 1500

107. A car moves with uniform speed of 120 km/h under the effect of force of the car engine F_1 = 1500N then the force of friction = ...N.

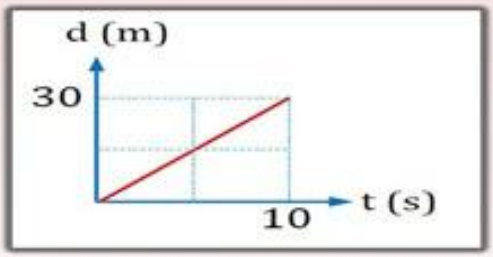
a. 0 b. 750 c. -1500 d. 1500

108. The following diagram represents the relation between Force (F) and time (t), So, the period in which the object moves with uniform speed is .....



a. AB b. BC c. CD d. DE

109. The following figure represents an object of mass 10 kg, so, the resultant force acting on this object = ...N.



a. 0 b. 3 c. 30 d. 300

110. If the resultant force acting upon an object vanishes, so, its.....vanishes.

a. speed b. acceleration c. displacement d. mass

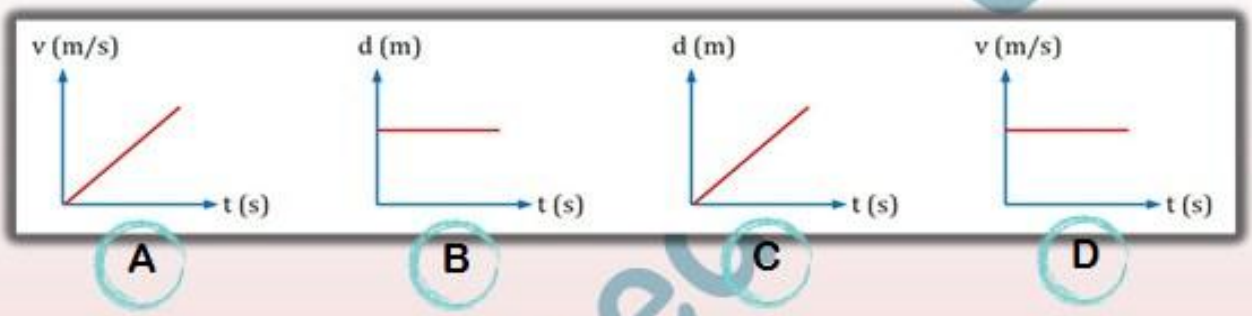
111. An officer on a training mission adjusts a cannon ($g = 10\ m/s^2$)

a. What is the angle that achieves the maximum horizontal range of the projectile?

b. What is the velocity of the projectile if it reaches a maximum height of 200 m when the angle of inclination is 60°?

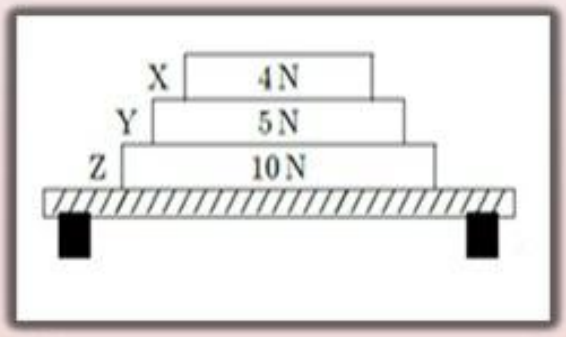
c. If the velocity of the projectile at the moment of launch is 800 m/s, what is its velocity after 10 s if the angle of inclination of the cannon is 10° ?

112. all the following graphs represent Newton`s 1st law except .....



113. In the following figure, X, Y and Z are three books at rest, so, the book Z reacts on book Y by a force .....N.

a. 10 b. 9 c. 5 d. 0



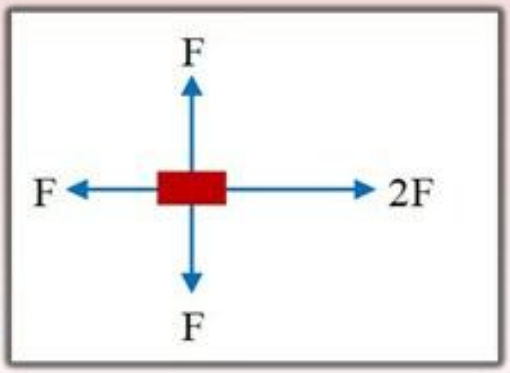
114. From the following figure, ...

a. object`s state doesn`t change

b. the object affected by balanced forces

c. The object applies Newton`s 1st law

d. The object moves with non-uniform speed



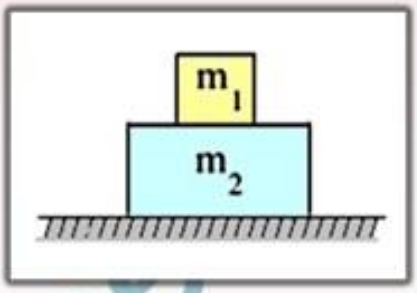
115. Three identical balls are thrown at the same time and with the same speed and from the same point, but the first ball is thrown vertically upward, the second ball is thrown at an angle of 45° above

the horizontal and the third ball is thrown at an angle of 60° above the horizontal, the ball that hits the ground first is the ball is .....

a. 1st ball b. 2nd ball c. 3rd ball d. all of them

116. If the mass m_1 = 30kg and mass m_2 = 60kg, then the ratio between the force that the m_1 effects on m_2 to the force that m_2 effect on m_1 equals .....

a. 1 : 1 b. 1 : 2 c. 2 : 1 d. 1 : 4



Model Exam on 1st Term

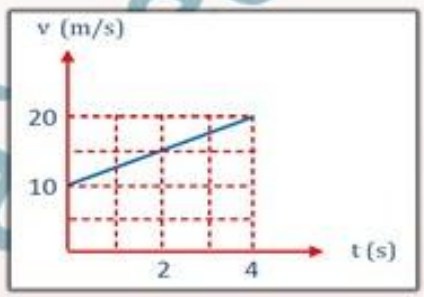
1. The periodic time of a certain pendulum is measured 5 times and the results was as follow:

   2.71s, 2.42s, 2.56s, 2.63s and 2.8s

   So, the average value of absolute error = ...

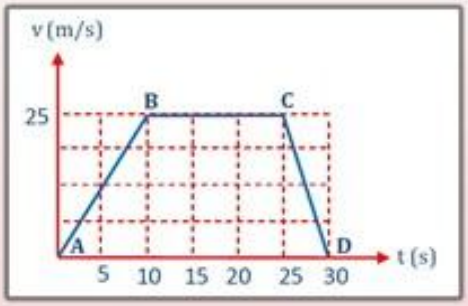
   a. 0.1s b. 0.11s c. 0.01s d. 1s

2. From the opposite graph, the displacement of the moving object within 4 sec = ...m.



   a. 40 b. 50 c. 80 d. 90

3. The period that achieves Newton`s 1st law is .....



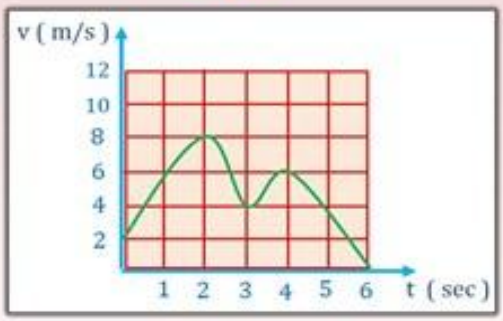
   a. AB b. BC

   c. CD d. None of them

4. A bullet moving in a horizontal path with a uniform velocity of 100 m/s hits a fixed target and dives a distance of 10 m until it stops inside the target. The acceleration with which the bullet moved = ...m/s^2.

   a. – 100 b. -200 c. - 400 d. – 500

5. In the following graph, the acceleration of the moving object at 2nd second = ...m/s^2.



   a. 0 b. 3

   c. 4 d. 8

6. If the dimensional formula of X = ML^2T^4 and that of Y = LT^2 and that of Z = MLT^2 which of the following is correct?

   a. X = Z/Y b. Y = X.Z c. Z = X.Y d. Y = X/Z

7. Two bodies are projected upwards in a gravitational field, the first is vertically upward and the second is projected at an angle of 30°, The condition that they reach the same vertical height during the same time is .....

a. The initial velocity of the first is equal to the initial velocity of the second

b. The initial velocity of the first is twice the initial velocity of the second

c. The initial velocity of the first should be half the initial velocity of the second

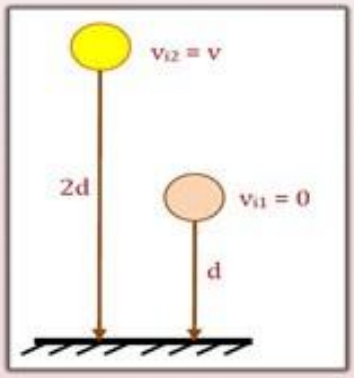
d. The initial velocity of the first must be a quarter of the velocity

8. The magnitude of cross product of two vectors is equivalent to their dot product when .....

a. They are perpendicular b. The angle between them = 45°

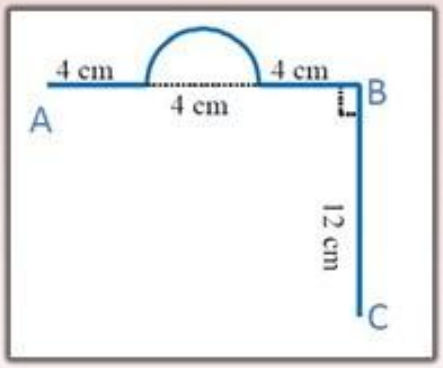
c. They are parallel d. The angle between them = 60°

9. The opposite figure shows the movement of two bodies, one of which falls freely from rest, and the other is thrown vertically down towards the ground with a speed V, so each of them took a time of 1sec until it reached the ground, So, the value of V = ...m/s



a. 2 b. 5 c. 10 d. 20

10. In the following figure, an object moves from point A towards point C passing through point B, so, the distance and displacement = ...cm respectively.



a. 32.57 - 24 b. 24 – 0

c. 24 - 32.57 d. 24 - 24

11. If $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}$, then b and c .....

a. must be equal b. must be unequal

c. may be equal or un equal d. cannot be defined

12. If Vector $\vec{A}$ = 5 units and vector $\vec{B}$ = 6 units, and the angle between them = 30° then $(\vec{A} \wedge \vec{B}) + (\vec{B} \wedge \vec{A})$ = ...

a. 60 b. 30 c. 120 d. 0

13. If the value of X = 500 mA + 7000 μA, then X = ...

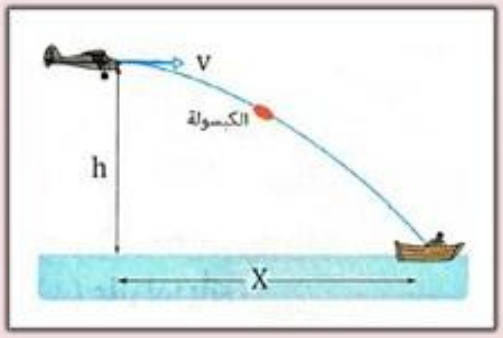
a. 5.7 A b. 70500 A c. 0.57 A d. 7500 mA

14. Two vectors A and B have the same magnitude and perpendicular to each other so the mathematical process that makes .....

Ch.	Maximum value	Equals 0
A	A . B	A - B
B	A . B	A ^ B
C	A ^ B	A – B
D	A ^ B	A . B

ESSAY QUESTIONS

1. The corresponding figure shows a rescue plane flying at a fixed vertical height (h) equal to 500 m above sea level at a constant speed of 55 m/s If it drops a rescue capsule to a person sitting in a boat at a horizontal distance from it, what should be the value of the distance (X) until the capsule reaches the person.



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2. A projectile is fired from a cannon with an initial velocity of 95 m/s and an angle of 50° with the horizontal, and after 5 sec it hits the top of a hill find: ($g = 10\ m/s^2$)

a. How high is the top of the hill above the launch point?

.....

.....

.....

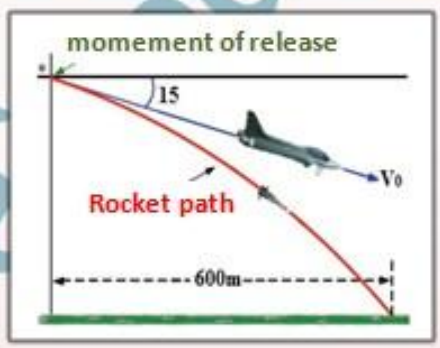
b. At what horizontal distance from the cannon hit the top of the hill?

.....

.....

.....

3. In the opposite figure, a fighter plane flying at a speed of 300 m/s, when it launched the missile, it was making an angle of 15° with the horizontal, and the horizontal distance between the launch point and the point of collision with the target on the ground was 600 m, find : ($g = 10\ m/s^2$)



1. How long does a missile stay in the air?

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2. The vertical distance between the launch point of the missile and the surface of the Earth?

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